

Linking International
Green Power Markets:
*Lessons from the APX Green
Tickets*

Fifth National Green Power Marketing Conference
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*Automated
Power Exchange*

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Presentation Overview

- The APX Green Power Markets
- Some historical prices and volumes
- Advantages of the certificate approach
- Linking international markets

APX Green Power Market

- Two components of green power:
 - Commodity Energy, delivered in real-time and traded up to a week-ahead
 - Green Ticket, created by green generation, issued after meter is read, and traded in a yearly market
- Green Power Price = Hourly Electricity Price + Green Ticket Premium
- APX Green Power Market provides method for generators to sell firm green power and buyers to purchase firm green power

Types of APX Green Tickets (In California)

- Technologies:
 - Geothermal
 - Biomass
 - Wind
 - Small Hydro
 - Solar
 - Landfill Gas
 - Generic Green
- Plant Vintage:
 - Existing
 - New
- CEC Eligibility:
 - Eligible
 - Non-eligible

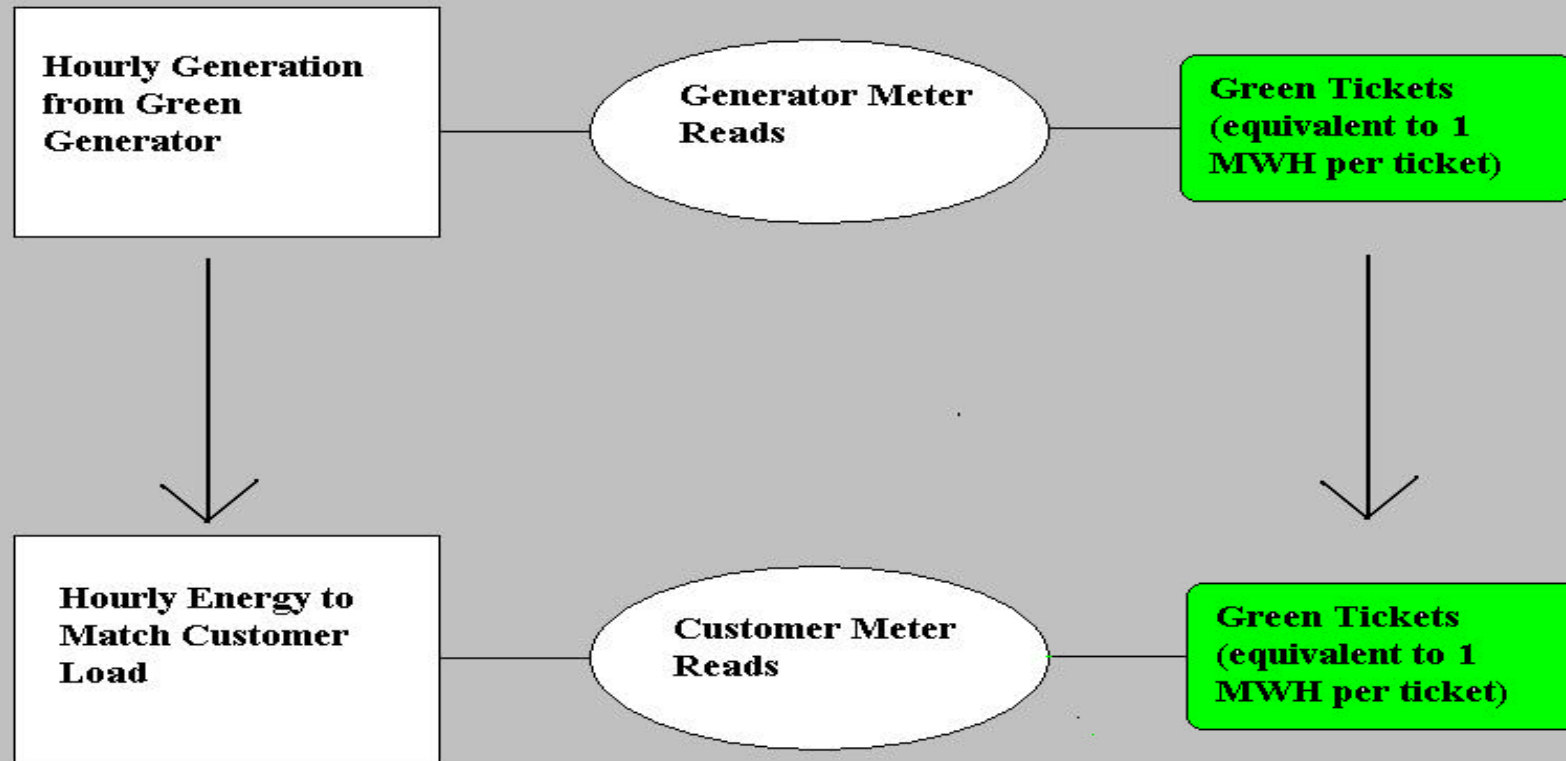
Types of APX Green Tickets (In Illinois)

- *EcoPower by ComEd* - extra premium from this ticket is re-invested into new renewable energy projects, and certified by Environmental Resources Trust (ERT)
- *Generic Renewable* - any renewable plant can sell into this category

Buying and Selling Green Tickets

- Generators can only sell into their own technology/vintage/CEC or ERT eligibility and the “generic green” category
- Buyers can purchase from any technology/vintage/CEC/ERT eligibility

APX Green Power Market



Year 2000 Green Ticket Market

APX Market Window

File Edit View Action Worksheet Window Help

Organizer Events Assets Market Bilateral Chart Summary Submit Withdraw Curve A/B Curve Options Cut Copy Paste FillDown Delete Undo

New Market Form (1)

Green Ticket Seller Sell 2000 Market: CEC Eligible Generic Green Tickets Annual Green

Markets	Bid		Ask		Trade		Quantity (MW)	Price /MWh	Overall		Sell	
	Volume	Price	Volume	Price	Volume	Price			Pending	Contracted	Capacity	Allowance
CEC Eligible Generic Green Tickets	236.0	2.88	120.0	5.00	367.0	2.93			95.0	850.0	1000.0	55.0
CEC Eligible Geothermal Tickets	300.0	3.00	705.0	5.85	550.0	6.00			95.0	850.0	1000.0	55.0
CEC Eligible Biomass Tickets			1290.0	2.20					95.0	850.0	1000.0	55.0
CEC Eligible Small Hydro Tickets									95.0	850.0	1000.0	55.0
CEC Eligible New Biomass Tickets									95.0	850.0	1000.0	55.0
CEC Eligible New Wind Tickets									95.0	850.0	1000.0	55.0

Annual Green Bids and Asks for 2000

Bid Qty:	236.0	Ask Qty:	25.0	50.0	45.0
Bid Prc:	2.88	Ask Prc:	5.00	8.00	9.50
Lot Size:	1 MW	Lot Size:	1 MW	1 MW	1 MW

Ticket CA GreenTicket to CA GreenTicket Next Closing Time: 04/01/01 00:00:00 Lot Size: 1 MW

Issuing Green Tickets in CA

(When APX is the SC)

- Generator provides copies of CEC certificates and registration numbers as part of APX registration process
- APX schedules and green generator delivers commodity energy to the grid
- APX receives meter reads verifying energy delivery to the grid
- APX issues Green Tickets to generator based on meter reads, subtracting any green power already delivered and scheduled under bilateral contracts

Issuing Green Tickets

(When APX Not is the SC and/or Generator is Out-of-State)

- Generator provides copies of CEC certificates and registration numbers as part of APX registration process (California only)
- Generator/SC schedules and delivers commodity energy to the grid
- Generator/SC provides meter reads to APX verifying energy delivery to the grid
- Generator/SC provides APX with affidavit stating that none of metered generation has been sold and delivered as green to another customer
- APX issues Green Tickets to generator based on meter reads

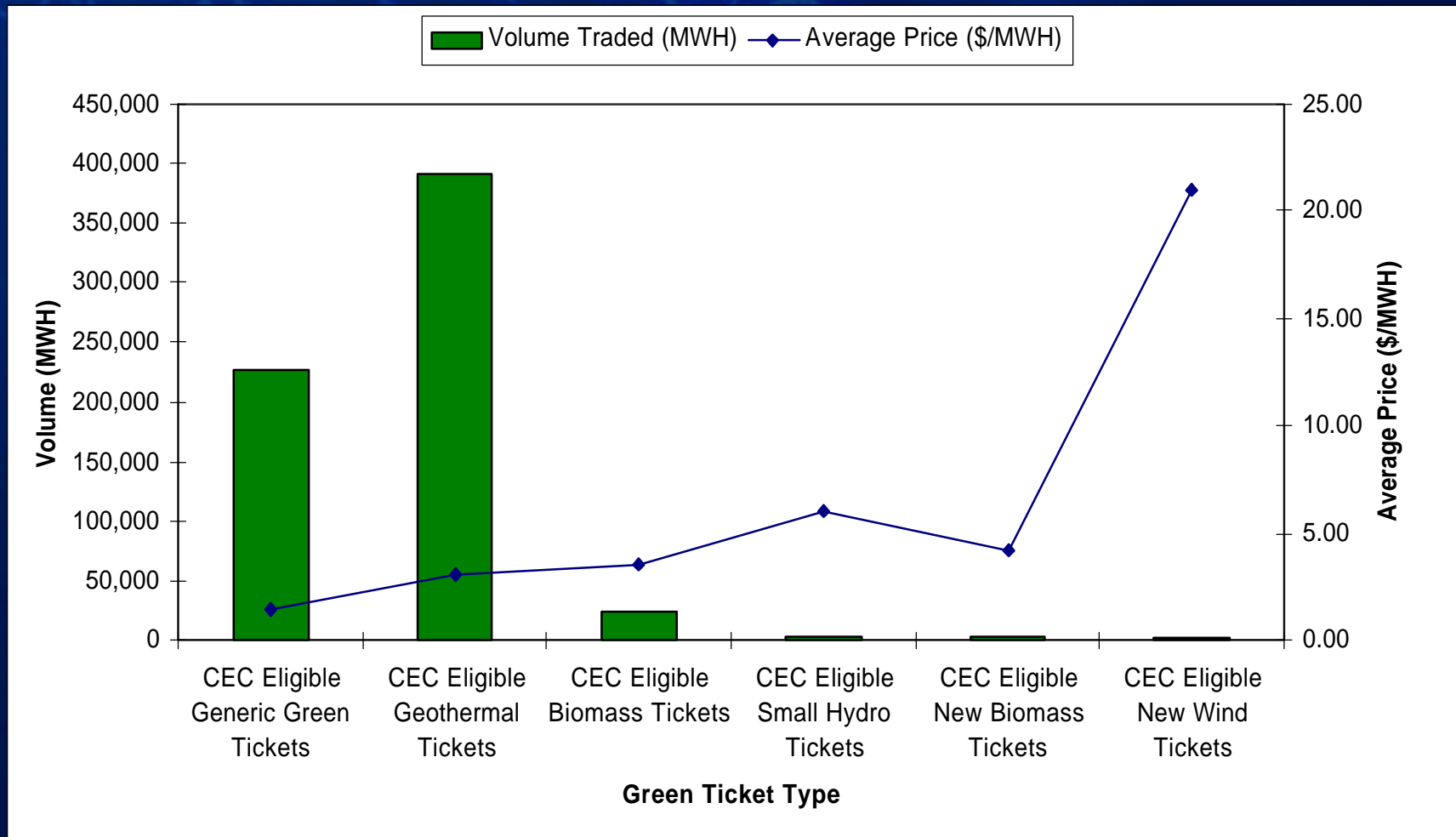
APX Green Ticket Market

- Current system provides means for
 - tracing and verifying renewable power production and purchases
 - verifying renewable supplier's claims
 - trading Green Tickets
- APX system tracks both APX Green Ticket trades and bilateral trades
- APX system is expanding as out-of-state green generators are added to the APX Green Power Market
- Provides simple, inexpensive and accurate method to track power production and delivery

***Summary of Average Prices by Technology for
APX Year 1999 Green Tickets
traded from May 1999 through July 31, 2000***

Commodity	Volume	Average
	Traded (MWH)	Price (\$/MWH)
CEC Eligible Generic Green Tickets	226,540	1.42
CEC Eligible Geothermal Tickets	392,211	3.08
CEC Eligible Biomass Tickets	23,448	3.53
CEC Eligible Small Hydro Tickets	3,591	5.99
CEC Eligible New Biomass Tickets	4,002	4.22
CEC Eligible New Wind Tickets	1,397	21.01
	651,189	2.58

Volume and Prices for Year 1999 Tickets

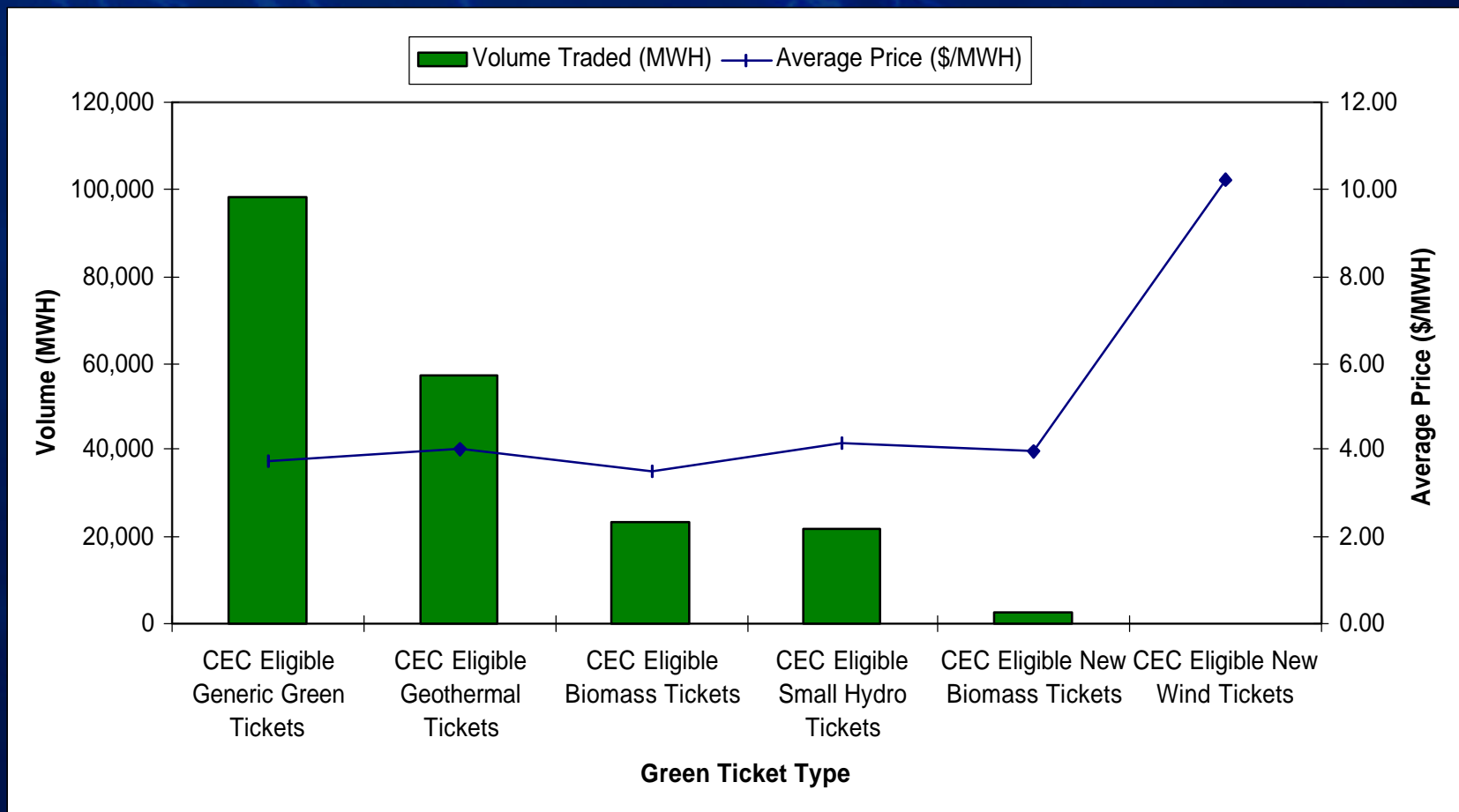


***Summary of Average Prices by Technology for
APX Year 2000 Green Tickets
traded from Jan 1 - July 31, 2000***

Commodity	Volume Traded (MWH)	Average Price (\$/MWH)
CEC Eligible Generic Green Tickets	98,038	3.76
CEC Eligible Geothermal Tickets	56,977	4.01
CEC Eligible Biomass Tickets	23,448	3.53
CEC Eligible Small Hydro Tickets	21,780	4.14
CEC Eligible New Biomass Tickets	2,800	3.95
CEC Eligible New Wind Tickets	6	10.21
	203,049	3.85

Volume and Prices for Year 2000

Tickets



Advantages of Certificate Trading Approaches

- Removes time-specific requirement (easier on intermittent generators)
- Makes verification easier. Less administrative burden for regulatory authorities.
- Premiums go directly to owners of assets
- A market based mechanism. Provides for a more liquid green exchange.
- Certificates applicable to other generation attributes: SO_2 , NO_x , CO_2

Linking International Markets

- For these reasons, certificate trading has strong appeal and good prospects in most US regions
- Outside of the USA, prototype certificate systems underway in 5 countries, being considered in 10 RECs countries, Japan, Australia, Poland and the list is growing
- APX is opening an exchange in UK, Japan and Sweden and is considering green products in these markets

Linking International Markets

- Some challenges:
 - pace of deregulation: progress of EC market-opening directive slow in some countries
 - Denmark, Sweden, developing certificates and ambitious RPS, market phase-in 2002
 - UK -- NETA regulations (penalties for intermittent generators, climate levy)
 - a common market requires a common product
 - green power definitions differ by country/state jurisdictions
 - eligible generation for Renewable Portfolio Standards can differ substantially by state
 - definition of technologies, applicability of incentive programs are not harmonized

Linking International Markets

- Other challenges
 - certification and verification
 - several institutions are offering different certification standards
 - cross-border verification potentially difficult
 - Regulation should encourage efficient markets, not hinder them
 - Example, capping certificate price (considered in UK, Australia). Obligations “crowding-out” market.
 - some say will remove incentive to comply (penalty price becomes price)
 - price ceilings can deter some technologies (ex., new wind power in CA)
 - Alternatives, options markets: hedge against high prices, technology bands

Linking International Markets

- From the perspective of the private sector:
 - start trading early, gain experience
 - allow certificates to trade separately from energy (increases liquidity, etc.)
 - allow for multiple technology attributes.
Countries have different definitions/standards.
 - Harmonized definitions lower costs, allow for asset comparability, facilitates cross-border and international trades

Linking International Markets

- Think ahead ... how will carbon trading markets affect nascent certificate markets ...
- ... and how can we make sure that they add to the incentives.

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